

Freeform Optics for Optical Payloads with Reduced Size and Weight, Phase I

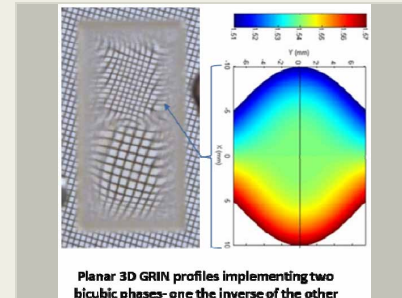
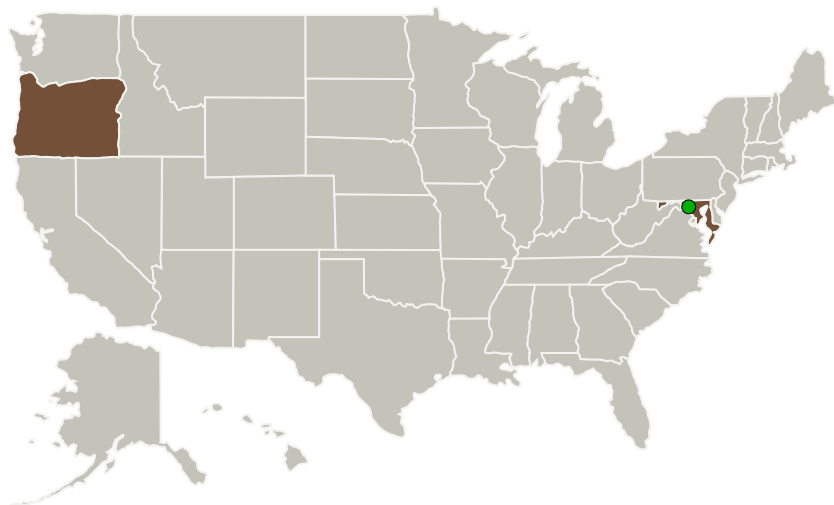
Completed Technology Project (2017 - 2017)



Project Introduction

Future optical systems for NASA's low-cost missions such as CubeSat and other small-scale payloads are constrained by the traditional spherical form of optics. As such, there is a movement away from traditional spherical optics to nonspherical optical lenses or mirror surfaces. Freeform optics are anticipated to enable benefits like fast wide-field and distortion-free cameras. Although various techniques to create complex optical surfaces are under investigation, the design and use of conformal and freeform shapes are currently costly due to fabrication and metrology of these parts. To address the need for lower-cost smaller-sized lighter-weight optics, freeform-surfaced 3D gradient-index optics will be developed that allow complex gradient-index profiles to be fabricated directly into the optical materials, allowing for optical power to be realized and for geometric and chromatic aberrations to be corrected, while reducing the tolerance requirements of freeform-surface machining. In Phase I, the 3D freeform optical-index materials will be demonstrated in planar, spherically figured, and 3D-freeform surface implementations. The 3D freeform GRIN materials will be shown to relax the requirements and lower the cost of optical design and manufacturing, while offering superior performance.

Primary U.S. Work Locations and Key Partners



Freeform Optics for Optical Payloads with Reduced Size and Weight, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
Voxel, Inc.	Lead Organization	Industry	Beaverton, Oregon
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Oregon

Project Transitions

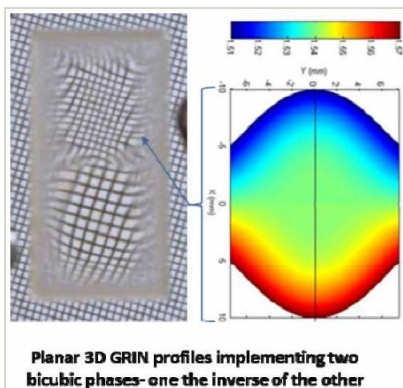
▶ **June 2017:** Project Start

✓ **December 2017:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140770>)

Images



Briefing Chart Image

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(<https://techport.nasa.gov/image/133125>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Voxel, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul Harmon

Technology Maturity (TRL)

Start: 3
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.2 Observatories
 - └ TX08.2.1 Mirror Systems